CHAPTER 7

SURFACE RADAR REPORTING

7.1. General. Radar observations of tropical cyclones will be made at Department of Defense (DOD), National Weather Service (NWS), and Federal Aviation Administration (FAA) Weather Surveillance Radar-1988 Doppler (WSR-88D) facilities. Participating radar sites are listed in Table 7-1.

7.2. The WSR-88D. The WSR-88D is a computerized radar data collection and processing system. The design and implementation of the WSR-88D was a joint effort of the DOD, NWS, and FAA, and the utilization of the radar continues to be governed by a triagency agreement. The WSR-88D is a 750 kilowatt, S-band (10 cm), coherent radar, with a nominal beam width of 1 degree. The maximum data ranges are 248 nm (reflectivity) and 124 nm (velocity). Radar scanning strategies are selectable, using predetermined volume coverage patterns (VCP). The VCP selected depends upon which weather phenomena are under surveillance. Once collected, the radar data are processed automatically at the radar site by a suite of algorithms which provide graphical products for forecaster use. TPC/NHC, as an external user, obtains these products through a dial-up connection. CPHC controls and operates four WSR-88Ds in Hawaii and obtains the products directly.

7.3. Procedures. In order to perform radar center-fixing and obtain other diagnostic information, TPC/NHC must obtain radar products from WSR-88D sites in the area of landfall. As a tropical cyclone approaches, software commands must be issued at the site, using the Unit Control Position (UCP), in order for TPC/NHC to obtain the necessary products. To facilitate this process, TPC/NHC, in cooperation with the Operational Support Facility (OSF), has developed an operations plan for use during tropical cyclone events (see Appendix X for details). The plan is also available via facsimile from the OSF hotline at 1-800-643-3363. A formal agreement between the NWS and DOD on the use of the plan at DOD facilities is pending.

7.3.1. Radar Observation Requirements, WSR-88D. Chief among the requirements is the appropriate display of hurricane-force winds. The WSR-88D, with default settings, will not display winds greater than 64 kt. Changes must be made at the radar site in order to deal effectively with hurricane conditions; the procedures are detailed in Appendix H, "WSR-88D Operations Plan for Tropical Cyclone Events." The physical characteristics of the tropical cyclone are best represented by use of the precipitation mode, usually VCP 11 or 21, depending upon range. Radar characteristics of hurricanes are given in *Federal Meteorological Handbook No. 11 (FMH-11), Part B*, "Doppler Radar Theory and Meteorology," Chapter 9. Further discussion of product usage appears in *FMH-11, Part D*, "Unit Description and Operational Applications." A recommended product list appears in *FMH-11 Part D*, Chapter 4, Table 4-1 (Application versus Product).

Table 7-1. Participating radar stations[1]

LOCATION	RADAR TYPE	LATITUDE	LONGITUDE
	NATIONAL WEATHER SERVICE RADARS U.S. Gulf and Atlantic Coasts		
Albany, NY	WSR-88D	42°35' N	74°04' W
Atlanta, GA	WSR-88D	33°22' N	84°34' W
Baton Rouge, LA	WSR-88D	30°20' N	89°49' W
Binghamton, NY	WSR-88D	42°12' N	75°59' W
Birmingham, AL	WSR-88D	33°10' N	86°46' W
Boston, MA	WSR-88D	41°57' N	71°08' W
Brownsville, TX	WSR-88D	25°55' N	97°25' W
Caribou, ME	WSR-88D	46°02' N	67°48' W
Charleston, SC	WSR-88D	32°33' N	80°47' W
Columbia, SC	WSR-88D	32°39' N	81°03' W
Corpus Christi, TX	WSR-88D	27°47' N	97°31' W
Ft. Worth, TX	WSR-88D	32°34' N	97°18' W
Greer, SC	WSR-88D	34°53' N	82°13' W
Houston, TX	WSR-88D	29°28' N	95°05' W
Jackson, MS	WSR-88D	32°19' N	90°05' W
Jacksonville, FL	WSR-88D	30°29' N	81°42' W
Key West, FL	WSR-88D	24°36' N	81°42' W
Lake Charles, LA	WSR-88D	30°07' N	93°13' W
Melbourne, FL	WSR-88D	28°07' N	80°39' W
Miami, FL	WSR-88D	25°37' N	80°25' W
Mobile, AL	WSR-88D	30°41' N	88°15' W
Morehead City, NC	WSR-88D	34°46' N	76°53' W
New Orleans, LA	WSR-88D	30°20' N	89°50' W
New York City, NY	WSR-88D	40°52' N	72°52' W
Philadelphia, PA	WSR-88D	39°57' N	74°25' W
Portland, ME	WSR-88D	43°53' N	70°15' W
Raleigh/Durham, NC	WSR-88D	35°40' N	78°29' W
Roanoke, VA	WSR-88D	37°01' N	80°16' W
San Antonio, TX	WSR-88D	30°43' N	97°23' W
Shreveport, LA	WSR-88D	32°27' N	93°50' W
State College, PA	WSR-88D	40°55' N	78°00' W
Sterling, VA	WSR-88D	38°58' N	77°29' W
Tallahassee, FL	WSR-88D	30°24' N	84°20' W
Tampa, FL	WSR-88D	27°42' N	82°24' W
Wakefield, VA	WSR-88D	36°59' N	77°00' W
Wilmington, NC	WSR-88D	33°59' N	78°26' W

[1]The criterion for selection is that the radar site lie within approximately 124 nm (maximum velocity range) of the coastline.

Table 7-1. Participating radar stations (continued)

NATIONAL WEATHER SERVICE RADARS

U.S. Southwest

Phoenix, AZ	WSR-88D	33°17' N	111°40' W
San Diego, CA	WSR-88D	33°49' N	117°38' W
Tucson, AZ	WSR-88D	31°57' N	110°54' W
Yuma, AZ	WSR-88D	32°40' N	114°37' W

FAA RADARS

Molokai, HI	WSR-88D	21°08'N	157°11'W
Kohala, HI	WSR-88D	20°06'N	155°45'W
San Juan, PR	WSR-88D	18°07'N	66°05'W
South Hawaii, HI	WSR-88D	19°06'N	155°34'W
South Kauai, HI	WSR-88D	21°54'N	159°33'W

DEPARTMENT OF DEFENSE

U.S. Gulf and Atlantic Coasts

Dover AFB, DE	WSR-88D	38°50'N	75°26'W
Eglin AFB, FL	WSR-88D	30°34'N	85°55'W
Fort Hood, TX	WSR-88D	30°43'N	97°23'W
Fort Polk, LA	WSR-88D	31°09'N	92°58'W
Fort Rucker, AL	WSR-88D	31°28'N	85°28'W
Maxwell AFB, AL	WSR-88D	32°32'N	85°47'W
Moody AFB, GA	WSR-88D	30°33'N	83°00'W
Robins AFB, GA	WSR-88D	32°40'N	83°21'W

(NHC has dial-in access to the above DOD sites.)

7.3.2. Central Region Report. The following fix definitions and criteria are used in reporting WSR-88D tropical cyclone radar observations:

- If the central region of a storm is defined by an identifiable circular, or nearly circular, wall cloud with an echo-free center, the fix (the geometric center) is reported as an "**EYE**."

- If the central region is recognizable, but not well defined by a wall cloud (as in the case of a tropical storm) , it is reported as a "**CENTER**."

- When the eye or center is only occasionally recognizable or some other central region uncertainty exists, the eye or center is reported as "**PSBL EYE**" or "**PSBL CENTER**."

Remarks stating the degree of confidence will be included, and will be classified as either "good," "fair," or "poor." If an eye is present, a "good" fix is reported when the eye is symmetrical--virtually surrounded by wall cloud; a "poor" fix is reported when the eye is asymmetrical--less than 50 percent surrounded by wall cloud; a "fair" fix is reported to express a degree of confidence between "good" and "poor." Note that a partial eyewall may be the result of excessive range from the radar or represent the true structure of the system. Doppler velocities will, in general, increase confidence in the center position, and if available, should always be examined prior to establishing a fix.

7.3.3. Transmission of Radar Reports. When the tropical cyclone is within 200 nm of a WSR-88D and the center fix is considered reliable, the appropriate tropical cyclone warning center (TPC/NHC or CPHC) may issue a tropical cyclone position estimate (AFOS category TCE) between 2-hourly intermediate advisories. Note that although the issuance of this product depends upon the quality of the radar fix, other data sources such as aircraft reconnaissance may be blended with the radar estimate to obtain a position. Thus, a radar position established on one particular radar may appear to disagree with the TCE position but has, in fact, been taken into consideration.

In the case of communications failure and/or an event that prevents the TPC/NHC from obtaining the necessary radar data, the local National Weather Service Office may be called upon to estimate the radar position and render a qualitative assessment of the circulation. Other radar facilities not having weather transmission capability, but wishing to provide information deemed important, should call the nearest National Weather Service Office or the TPC/NHC.